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here in high degree, and are regarded by WITTE¹⁰ as of advantage in checking transpiration. The alfvar was very fully treated from this standpoint some years ago by GREVILLIUS. Some plants commonly herbs here become half-shrubs, e. g., *Gypsophila fastigiata*. There is an excellent study made of the underground organs, which are frequently neglected.—H. C. COWLES.

Lateral roots.—NORDHAUSEN has studied the direction and growth of lateral roots under the influence of external factors, particularly those which arise from the removal of portions of the main root or its wounding.¹¹ It is well known that when a millimeter or less of the primary root is cut off, regeneration of the tip occurs; but when larger portions are removed, one or more of the lateral roots change their angle with the main axis, as it were to substitute themselves for it. NORDHAUSEN can only say, as one result of his studies, that this reaction on the part of the lateral roots is "dependent upon the intensity and quality of internal conditions which bear more or less relation to the needs of the plant," which of course is an empty form of words. It was already known that decapitation within the growth zone results in a very active substitution response. If the cutting exceeds this, however, whether much or little, says NORDHAUSEN, this response is minimal or wanting, provided a rather long piece of the primary root remains; but shortening the stump beyond a certain amount again increases the response. The alteration of the angle of the substitute roots with the main axis rests, contrary to the conclusions of BRUCK and CZAPEK, upon both geotropic and autotropic factors, of which the former is determinative. This substitution of lateral roots is independent of actual wounding, since it can be brought about by merely checking the growth, especially of the main axis. A partial response follows, even without disturbance or operation on the growing point, if certain tracts within the central cylinder (not only in the phloem but especially in the xylem) are interrupted by lateral wounding. The disturbance of nutrition here plays only a subordinate rôle. NORDHAUSEN agrees with McCALLUM in assuming the existence of specific inhibitory stimuli, regulating the formation of organs in intact plants. Certain roots (*Lupinus*, *Phaseolus*) respond to a temporary past reduction in the water supply by altering the angle of lateral roots, which at the time of the difficulty had not even appeared, though when they develop they are under normal conditions. Lateral wounding of the main root leading to direct or indirect affection of the pericambium, even before the lateral roots become visible, produces a traumotropic deviation of these from the wounded side. The transmission of the excitation, easier in the acropetal than the basipetal direction, may produce sympathetic response of more distant lateral roots.

The influence of curvature of the main root upon the form and lateral deviation of the side roots, determined by NOLL and explained (?) as morphaesthesia, is due, according to NORDHAUSEN, to changes in the tension of the central cylinder,

¹⁰ WITTE, H., Till de Svenska alfvarväxternas ekologi. pp. 119. Upsala. 1906.

¹¹ NORDHAUSEN, M., Ueber Richtung und Wachstum der Seitenwurzeln unter dem Einfluss äusserer und innerer Faktoren. Jahrb. Wiss. Bot. 44:557-634. 1907.

particularly of the pericambium. He finds these effects producible by injuries, depression of turgor, etc., which need only act in the past, while the growth of the lateral roots takes place under regular conditions.—C. R. B.

Soil fertility.—Two recent bulletins from the Bureau of Soils deal with the question of the factors affecting soil fertility. One, by LIVINGSTON and others,¹² demonstrates the presence in unproductive soils of substances deleterious to plant growth. He adds the evidence gathered up to the close of his work that the toxic substances are apparently produced by the plants themselves growing in soil and water cultures. He finds that such toxic substances can be dissolved partly in a watery extract of soil and may be removed from such an extract by shaking with finely divided insoluble solids. This leads to the further suggestion, partly supported by experiment, that stable manure and green fertilizers are beneficial rather by their action on the soil constituents, than by either the salts or the organic matter put at the disposal of the plants. Incidentally it was found necessary to devise methods for securing non-toxic distilled water. The most satisfactory water was prepared by shaking ordinary distilled water with fine, clean carbon black or precipitated ferric hydrate and filtering.

Developing the idea suggested by LIVINGSTON's work, SCHREINER and REED¹³ show that the toxic substances originate from the plants themselves, diffusing from their roots. This they demonstrate by direct experiment with seedling wheat and other plants, and support by adducing experiments and observations which have been accumulating for years, and can be best explained by their experimental results. It appears, for example, that the excreta from no other roots were so harmful to wheat as its own, and that the excreta from oats were more harmful to wheat than those from the less closely related corn and cowpea. The natural succession of plants, the deleterious effects of grass sod on apple trees, oak-openings, fairy rings, crop rotation, the effects of good tillage, can all be rationally explained in the light of the facts adduced.

SCHREINER and REED have also published the substance of this bulletin in another paper which requires only citation.¹⁴—C. R. B.

Items of taxonomic interest.—A. A. HELLER (*Muhlenbergia* 2:269-338. 1907), in an enumeration of plants collected in the coast region of California during 1907, describes new species in *Limnia* (*Claytonia*), *Lathyrus*, *Lupinus*, *Trifolium*, *Amsinckia*, *Stachys* (3), and *Plectritis* (2); and also proposes *Heleniaceae*, *Anthemidaceae*, and *Senecionaceae* as new families.—E. O. WOOTON and P. STANLEY

¹² LIVINGSTON, B. E. Further studies on the properties of unproductive soils. U. S. Dept. Agric., Bureau of Soils, Bull. 36. pp. 71. *pls.* 7. 1907.

¹³ SCHREINER, O., and REED, H. S., Some factors influencing soil fertility. U. S. Dept. Agric., Bureau of Soils, Bull. 40. pp. 40. *pls.* 3. 1907.

¹⁴ SCHREINER, O., and REED, H. S., The production of deleterious excretions by roots. Bull. Torr. Bot. Club 34:279-303. 1907.